UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF MISSOURI
EASTERN DIVISION

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| MONSANTO COMPANY, | ) | |
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| Plaintiff, | ) | |
| | ) | |
| vs. | ) | Case No. 4:00CV01915 ERW |
| | ) | |
| BAYER BIOSCIENCE N.V., | ) | |
| | ) | |
| Defendant. | ) | |

**MEMORANDUM AND ORDER**

This matter comes before the Court upon Defendant's Motion for Summary Judgment [doc. #490]. On December 4, 2000, Monsanto Company [Monsanto] filed suit against Bayer Bioscience N.V. [Bayer] seeking a declaratory judgment that Monsanto's MON810 product, also known as YieldGuard, does not infringe on certain patents owned by Bayer. Monsanto also seeks a declaratory judgment that Bayer's patent claims are invalid and unenforceable. At this time, the only patent claims that remain in issue are Claims 1, 2, 5, 7, 8, and 12 of Bayer's United States Patent 5,545,565 [the '565 patent].[1] Defendant seeks partial summary judgment claiming that

[1]The claims still in issue are 1, 2, 5, 7, 8, and 12. The claims are as follows:
1. A chimeric gene comprising: (1) a DNA fragment encoding an insecticidal *Bacillus thuringiensis* Bt2 toxin of about 60 to about 80 kD, wherein said Bt2 toxin comprises the amino acid sequence of SEQ ID No. 1 from amino acid position 29 to amino acid position 607; and (2) a promoter region of a gene naturally expressed in plant cells, wherein said DNA fragment is under the control of said promoter region.
2. The chimeric gene as defined in claim 1, wherein said Bt2 toxin comprises the amino acid sequence of SEQ ID No. 1 from amino acid position 1 to an amino acid position between amino acid position 607 and amino acid position 725.
5. The chimeric gene as defined in claim 1, wherein said Bt2 toxin comprises the amino acid sequence of SEQ ID No. 1 from amino acid position 1 to amino acid position 725.
7. The chimeric gene as defined in claim 1, wherein said DNA fragment is artificially made.

Monsanto's defenses based on failure to comply with the written description and enablement provisions of 35 U.S.C. § 112 fail as a matter of law. For the reasons below, the motion is granted in part and denied in part.[2]

## I. BACKGROUND

The '565 patent claims specify an invention of a "chimeric gene[3]. . . encoding Bt2 toxin. . ., wherein said Bt2 toxin comprises the amino acid sequence of SEQ ID No. 1[.]" SEQ ID No. 1, as used in the '565 patent, identifies the full amino acid sequence of the Bt2 gene.[4] The patent also discloses one of the DNA sequences that will encode the amino acid sequence described as SEQ ID No. 1.

DNA is a double helix that, horizontally, consists of base pairs of nucleotides. The DNA and RNA strands are complimentary. In DNA, the nucleotide adenine (A) pairs with nucleotide thymine (T), and cytosine (C) pairs with guanine (G). The DNA makes mRNA (messenger RNA). The RNA is made by one side of the DNA helix being read and its complementary base strand being synthesized. For example, if T is the base on the DNA helix, then the complimentary RNA synthesized will be A. There is one exception. There is no T nucleotide on the RNA strand; instead, uracil (U) pairs with A. So, if there is A on the DNA strand, the pair on the

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> 8. The chimeric gene as defined in any of claims 2 to 6, wherein said DNA fragment is artificially made.
> 12. The chimeric gene as defined in claims 1 or 9, wherein said promoter region is from a ribulose bisphosphate carboxylase small subunit gene, a TR-DNA gene, a Cauliflower Mosaic Virus 35S gene, or a nopaline synthase gene.

[2]Any allegations of fraud based on inequitable conduct were addressed by the Court in its January 10, 2005 Order denying Monsanto's Motion for Summary Judgment.

[3]A "chimeric gene" is comprised of parts that do not occur in nature together. The insecticidal Bt2 protein does not naturally occur in a plant's DNA.

[4]SEQ ID No. 1 is the name given to describe the disclosed 4014 base pairs of nucleotides encoding the amino acid sequence of the Bt2 gene.

complementary RNA strand will be U. The RNA is responsible for synthesis of the proteins that give each cell its certain phenotype (physical characteristics).

Codons are identified along the DNA strand. Every three nucleotides, or a "triplet," makes up a codon. Because there are four base nucleotides possible (A,T,C,G) in each of the three "spots" in a codon, there are 4 X 4 X 4 possible codons (64). Three codons act as "stop" signals. Each of the remaining 61 codons encodes an amino acid. Scientists have learned that there are 20 different naturally occurring amino acids. Since there can be 61 different codon combinations that encode an amino acid, and there are only 20 different amino acids, often more than one codon will encode the same amino acid. Multiple nucleotide combinations comprising codons can encode the same amino acid. This phenomena explains the "degeneracy" or "redundancy" of the genetic code. In fact, up to six different codons can encode one amino acid. For example, the codons TTT and TTC both encode the amino acid Phenylalanine. The so-called genetic code is basically a table identifying which amino acid each codon encodes. This "codon table" permits the reverse analysis. If the encoded amino acid is known, it is possible to determine which codon or codons encoded it. A sequence of amino acids forms a particular protein; in this case, the *Bacillus thuringiensis* [Bt] protein. Because Bayer disclosed the amino acid sequence of the Bt protein in the '565 patent, it is possible to refer to a codon chart to determine all the possible nucleotide combinations that would encode those amino acids.[5] Prior to the filing date of Bayer's '565 patent application,[6] persons of ordinary skill in the art were able to chemically synthesize DNA strands that encoded particular amino acid sequences. It is undisputed that Bayer did not specifically describe any preferred plant codon usages.

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[5]Monsanto argues that the patent does not teach one how to create a codon-modified gene. Monsanto has coined this process "codon-optimization." This Court finds, however, that simply referring to a codon chart and an introductory biology textbook would allow a person ordinarily skilled in the art to determine all possible nucleotide combinations that would encode the Bt2 protein since the amino acid sequence was disclosed in the '565 patent.

[6]The '565 patent application was filed on January 22, 1986.

Bayer faced problems with Bt protein expressing in plants. It appears that part of the problem was that the protein was just too big in size to be effectively introduced into the plant. Also, the mRNA strand that was created was often very unstable and was unsuccessful in telling the cell to produce the Bt protein. Another potential cause of the Bt protein failing to express was the incomplete transcription of the gene.

The specification shows that Bayer started experimenting with the length of the protein in order to see whether a shorter fragment would still express toxicity in plants. The top end of the DNA fragment is the 5' (five prime or N Terminal) side. The tail, or bottom, end of the fragment is the 3' (three prime) end. In the specification of the patent, Bayer described its process for truncating (shortening) the gene on the 3' end.[7] Bayer's goal was to make the DNA fragment as short as possible with the remaining amino acid sequence still forming the toxic portion of the Bt protein. Bayer called this truncated Bt protein the "Bt2 protein." Bayer truncated the DNA fragment so that the protein was smaller and easier to work with, and Bayer claimed that the shorter fragment reduced the unpredictability in the expression of the Bt protein in plants. The specification did not disclose that the gene could be shortened at the front 5' end and retain its ability to encode for a Bt toxin.

**II. SUMMARY JUDGMENT STANDARD**

Pursuant to Federal Rule of Civil Procedure 56(c), a court may grant a motion for summary judgment only if all of the information before the court shows "there is no genuine issue of material fact and the moving party is entitled to judgment as a matter of law." Fed. R. Civ. P. 56(c); Crumley v. City of St. Paul, 324 F.3d 1003, 1006 (8th Cir. 2003). The United States Supreme Court has noted that "[s]ummary judgment procedure is properly regarded not as a

[7]A "gene" is a layman's term for a functional sequence of base pairs in a particular location on the DNA strand. A gene, because it is a functioning part of your DNA, will enable (encode) the cell to "express" some function or physical characteristic. In this patent, Bayer hoped that once this bacteria gene was introduced into a plant's cell, the plant would express the same function as the bacteria had before it was put into the plant cell - an insecticidal function.

disfavored procedural shortcut, but rather as an integral part of the federal rules as a whole, which are designed to 'secure the just, speedy and inexpensive determination of every action.'" Celotex Corp. v. Catrett, 477 U.S. 317, 322 (1986) (quoting Fed. R. Civ. P. 1).

"'By its terms, [Rule 56(c)(1)] provides that the mere existence of *some* alleged factual dispute between the parties will not defeat an otherwise properly supported motion for judgment; the requirement is that there be no *genuine* issue of *material* fact.'" Hufsmith v. Weaver, 817 F.2d 455, 460 n.7 (8th Cir. 1987) (quoting Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 247-48 (1986) (emphasis added by Supreme Court)). Material facts are "those 'that might affect the outcome of the suit under governing law.'" Id. (quoting Anderson, 477 U.S. at 247-48). Summary judgment will be denied due to a material issue of genuine fact if "the evidence is sufficient to allow a reasonable jury to return a verdict for the non-moving party." Crumley, 324 F.3d at 1006. Further, if the non-moving party has failed to "make a showing sufficient to establish the existence of an element essential to that party's case, . . . there can be 'no genuine issue as to any material fact,' since a complete failure of proof concerning an essential element of the nonmoving party's case necessarily renders all other facts immaterial." Celotex, 477 U.S. at 322-23, quoted in St. Jude Med., Inc. v. Lifecare Intern., Inc., 250 F.3d 587, 595 (8th Cir. 2001).

The initial burden of proof in a motion for summary judgment is placed on the moving party to establish the non-existence of any genuine issue of fact that is material to a judgment in its favor. Crumley, 324 F.3d at 1006 (citing Lynn v. Deaconess Med. Ctr.-W. Campus, 160 F.3d 484, 487 (8th Cir. 1998)). The burden then shifts to the non-moving party who must set forth specific evidence showing that there is a genuine dispute as to material issues. Anderson, 477 U.S. at 249. To meet its burden, the non-moving party may not rest on the pleadings alone and must "do more than simply show there is some metaphysical doubt as to the material facts." Matsushita, 475 U.S. at 586.

In analyzing summary judgment motions, the court must view the evidence in the light most favorable to the non-moving party. Crumley, 324 F.3d at 1008. The non-moving party is given the benefit of any inferences that can logically be drawn from those facts. Matsushita, 475 U.S. at 586. The court may not "weigh the evidence in the summary judgment record, decide credibility questions, or determine the truth of any factual issue." Kampouris v. St. Louis Symphony Soc., 210 F.3d 845, 847 (8th Cir. 2000). The court instead "perform[s] only a gatekeeper function of determining whether there is evidence in the summary judgment record generating a genuine issue of material fact for trial on each essential element of a claim." Id.

**III. DISCUSSION**

Monsanto argues that the '565 patent is invalid because the specification fails to satisfy the (1) written description and (2) enablement requirements. Section 112 requires that

> [t]he specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same[.] . . .The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

35 U.S.C. § 112 (2004). This paragraph imposes two separate, distinct requirements. First the "written description" requirement

> is broader than to merely explain how to 'make and use'; the applicant must also convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession *of the invention*. The invention is, for purposes of the 'written description' inquiry, *whatever is now claimed*.

Forssmann v. Matsuo, 23 U.S.P.Q.2d 1548, 1551 (1992) (quoting Vas-Cath, Inc. v. Mahurkar, 935 F.2d 1555, 1563-64 (Fed. Cir. 1991); Fiers v. Revel, 984 F.2d 1164, 1170 (Fed. Cir. 1993). Inconsistencies between the specification and claim limitations often arises because, during the patent prosecution, the applicant amends the claims to include limitations not disclosed in the applicant's original description of the invention. TurboCare Div. of Demag Delaval

Turbomachinery Corp. v. Gen. Elec. Co., 264 F.3d 1111, 1118 (Fed. Cir. 2001); Vas-Cath, Inc., 935 F.2d at 1560.

The second requirement is the "enablement" requirement. "The specification need not explicitly teach those in the art to make and use the invention; the requirement is satisfied if, given what they already know, the specification teaches those in the art enough that they can make and use the invention without 'undue experimentation.'" Amgen, Inc. v. Hoechst Marion Roussel, Inc., 314 F.3d 1313, 1334 (Fed. Cir. 2003). When deciding whether the invention would require "undue experimentation, the Court may consider factors such as "(1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims." In re Wands, 858 F.2d 731, 737 (Fed. Cir. 1988). Enablement is a question of law based on the underlying facts, and the party claiming the patent is invalid must prove lack of enablement by clear and convincing evidence. Chiron Corp. v. Genentech, Inc., 363 F.3d 1247, 1253 (Fed. Cir. 2004); EMI Group North Amer., Inc. v. Cypress Semiconductor Corp., 268 F.3d 1349 (Fed. Cir. 2001).

In order for claims to be enabled, "the scope of the claims must bear a reasonable correlation to the scope of enablement provided by the specification to persons of ordinary skill in the art." Plant Genetic Sys., N.V. v. Dekalb Genetics Corp., 315 F.3d 1335, 1339-40 (Fed. Cir. 2003); Amgen, Inc. v. Chugai Pharm. Co., LTD., 927 F.2d 1200, 1212 (Fed. Cir. 1991).

> [W]e do *not* imply that patent applicants in art areas currently denominated as "unpredictable" must never be allowed generic claims encompassing more than the particular species disclosed in their specification. It is well settled that patent applicants are not required to disclose every species encompassed by their claims, even in an unpredictable art. However, there must be sufficient disclosure, either through illustrative examples or terminology, to teach those of ordinary skill how to make and how to use the invention as broadly as it is claimed. This means that the disclosure must adequately guide the art worker

> to determine, without undue experimentation, which species among all those encompassed by the claimed genus possess the disclosed utility.

In re Vaeck, 947 F.2d 488, 496 (Fed. Cir. 1991).

**A. The Written Description Requirement**

Monsanto argues that the '565 patent was not adequately described pursuant to 35 U.S.C. § 112. "An adequate written description of a DNA requires more than a mere statement that it is part of the invention and reference to a potential method for isolating it; what is required is a description of the DNA itself. Fiers, 984 F.2d at 1170. The description "requires a precise definition, such as by structure, formula, chemical name, or physical properties, not a mere wish or plan for obtaining the claimed chemical invention." The Regents of the Univ. of Cal. v. Eli Lilly & Co., 119 F.3d 1559, 1566 (Fed. Cir. 1997) (quoting Fiers, 984 F.2d at 1171). Bayer relies on In re Wallach for its argument that the full disclosure of the amino acid sequence in the '565 patent satisfies the written description requirement. In that case, the court held that

> we see no reason to require a patent applicant to list every possible permutation of the nucleic acid sequences that can encode a particular protein for which the amino acid sequence is disclosed, given the fact that it is. . . a routine matter to convert back and forth between an amino acid sequence and the sequences of the nucleic acid molecules that can encode it.

Id. at 1334. However, because the applicant had only listed approximately 5% of the amino acid sequence of the claimed protein, the court held that the specification did not adequately describe the claimed invention. In this case, Bayer disclosed the full amino acid sequence of the claimed Bt2 protein. Bayer went even further by disclosing one full nucleotide sequence that encoded the full amino acid sequence. Monsanto argues that the '565 claims "cover an unfathomly large number of genetic sequences encoding a particular truncated Bt2 protein[.]" However, this argument fails because one can easily determine the full scope of genes covered by the '565 patent

simply by referring to a codon chart. Pursuant to the analysis found in In re Wallach, this Court finds that Bayer adequately described the full Bt2 sequence in the patent specification.

Monsanto argues that even if the full Bt2 protein sequence is adequately disclosed in the patent specification, the truncated gene in Claim 1 was not adequately described.[8] In Forssmann v. Matsuo, the court found that a claim was not adequately described in the specification even though the applicant, within the larger disclosed peptide sequence, had disclosed the full amino acid sequence of the fragment, and the specification taught the concept of truncation. 23 USPQ.2d 1548, 1551-52 (Bd. Pat. App. & Interf. 1992). In this case, the original patent claims recited limitations relating to truncated Bt genes. The claims did not indicate where the gene would be truncated. However, the specification taught one how to remove nucleotides at the 3' end. Nowhere did the specification make any mention of truncating the gene on the 5' (N Terminal) end.

In 1993, Bayer amended its claims and recited new claims with limitations relating to Bt genes being truncated on both the 3' and 5' ends. For example, Claim 1 recites a

> A chimeric gene comprising: (1) a DNA fragment encoding an insecticidal *Bacillus thuringiensis* Bt2 toxin of about 60 to about 80 kD, wherein said Bt2 toxin comprises the amino acid sequence of SEQ ID No. 1 from amino acid position 29 to amino acid position 607; and (2) a promoter region of a gene naturally expressed in plant cells, wherein said DNA fragment is under the control of said promoter region.

The DNA fragment recited in this claim has been truncated on the 5' end at amino acid position 29. The Court finds that Bayer was not in possession of this amended claim at the time it filed its patent application because the specification lacks a description of the truncation of the gene on the 5' end. See Vas-Cath, Inc., 935 F.2d at 1563-64. The Court notes that 35 U.S.C.A. § 282 mandates that

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[8]The Court notes that Bayer did not respond to Monsanto's arguments relating to truncation of the gene on the 5' end.

> A patent shall be presumed valid. Each claim of a patent (whether in independent, dependent, or multiple dependent form) shall be presumed valid independently of the validity of other claims; dependent or multiple dependent claims shall be presumed valid even though dependent upon an invalid claim.

However, the Court finds that Claim 7 has not been adequately described since the limitation recites an artificially-made gene as defined in Claim 1. The limitations of Claim 7 require truncation on the 5' end. Claim 12 is also not adequately described in the specification because the claim discloses the same gene as the chimeric Bt gene defined in Claim 1, the limitation simply recites a different promoter region.

The Court finds that the other claims of the '565 patent still in issue in this case were not truncated on the 5' end. Claims 2, 5, and 8 disclose chimeric Bt genes that are only truncated on the 3' end. For this reason the Court holds that Claims 1, 7, and 12 of the '565 patent are invalid as a matter of law, and summary judgment is appropriate.[9] However, the remaining Claims 2, 5, and 8 have been adequately described in accordance with § 112, and summary judgment in favor of Bayer is appropriate.

**B. The Enablement Requirement**

Monsanto argues that the '565 patent was not enabled pursuant to 35 U.S.C. § 112 because the Bt2 gene had limited success, and little or no toxin was observed in several plants. "Even if some of the claimed combinations were inoperative, the claims are not necessarily invalid. . . .[I]f the number of inoperative combinations becomes significant and in effect forces one of ordinary skill in the art to experiment unduly in order to practice the claimed invention, the claims might indeed be invalid." EMI Group North Amer., Inc. v. Cypress Semiconductor Corp., 268 F.3d 1342, 1248-49 (Fed. Cir. 2001). The "predictability of the art" must be considered when the

[9]Although there is no motion for summary judgment filed by Monsanto pending in relation to its § 112 defenses, Bayer indicated in its Reply to Monsanto's Response to its Motion for Summary Judgment that "if the Court believes that Monsanto's § 112 arguments are legally correct, the Court should grant summary judgment to Monsanto[.]"

court determines whether one of ordinary skill in the art would be required to do undue experimentation to practice the invention. Chiron Corp. v. Genentech, Inc., 363 F.3d 1247, 1253 (Fed. Cir. 2004). Furthermore,

> it is not necessary that a patent applicant test all the embodiments of his invention; what is necessary is that he provide a disclosure sufficient to enable one skilled in the art to carry out the invention commensurate with the scope of his claims. For DNA sequences, that means disclosing how to make and use enough sequences to justify grant of the claims sought.

Amgen, 927 F.2d at 1213 (claims were not enabled because even after five years of experimentation, that patent holder was unable to specify which gene analogs had the biological properties set forth in the claims).

Monsanto argues that the '565 patent claims are not enabled because many of the nucleotide sequences encompassed by the patent do not result in expression of an insecticidal toxicity in plants. Bayer argues that the claims of the '565 patent say nothing about plants or expression in plants. The Court agrees with Bayer that the patent requires only a gene comprised of a DNA fragment **encoding an insecticidal Bt2 toxin**. It is improper to look at the expression levels alone to determine whether the claims are enabled. However, it is proper to determine if the reason for inconsistent expression is that the DNA fragment is, in fact, **not** encoding the insecticidal Bt2 toxin.

The '565 patent itself teaches that Bayer had difficulties with the Bt protein expression levels. The specification cites problems such as: (1) incomplete transcription of the gene; (2) inefficient processing of the messenger RNA; and (3) instability of the RNA. One of the reasons that the gene would fail to express is that the DNA fragment was **not** encoding an insecticidal Bt toxin due to one of these problems.

The fact that Bayer and Monsanto continued to have problems with expression levels with the Bt2 protein is evidence that these same problems continued to exist with the truncated

Bt2 protein disclosed in the '565 patent. Monsanto claims that undue experimentation was required to determine which codon-modified genes did have adequate expression levels in plants. If the number of inoperative nucleotide combinations was significant *due to the DNA fragment failing to encode an insecticidal Bt toxin*, the '565 patent claims were not enabled. For this reason, there is a genuine question of material fact as to (1) whether inconsistent expression levels were due to the DNA fragment failing to encode an insecticidal toxin in a significant number of the DNA sequences, (2) whether the number of DNA sequences that did encode the Bt toxin was sufficient to justify the grant of the claims sought, and (3) whether undue experimentation would be required to determine which codon-modified genes would encode an insecticidal Bt2 toxin.

Accordingly,

**IT IS HEREBY ORDERED** that Defendant's Motion for Partial Summary Judgment Dismissing Monsanto's Defenses Under 35 U.S.C. Section 112 [doc. # 490] is **GRANTED in part** and **DENIED in part**.

**IT IS FURTHER ORDERED** that the Court grants the Motion for Partial Summary Judgment relating to the written description requirement of 35 U.S.C. § 112. Claims 1, 7, and 12 are invalid because the specification does not adequately describe them. Claims 2, 5, and 8 are not invalid and have been adequately described pursuant to 35 U.S.C. § 112.

**IT IS FURTHER ORDERED** that the Court denies the Motion for Partial Summary Judgment relating to the enablement requirement of 35 U.S.C. § 112. The Court finds genuine issues of material fact as to (1) whether inconsistent expression levels were due to the DNA fragment failing to encode an insecticidal toxin in a significant number of the DNA sequences, (2) whether the number of DNA sequences that did encode the Bt toxin was sufficient to justify the

grant of the claims sought, and (3) whether undue experimentation would be required to determine which codon-modified genes would encode an insecticidal Bt2 toxin.

Dated this 10th day of May, 2005.

E. RICHARD WEBBER
UNITED STATES DISTRICT JUDGE